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SOCIOECONOMIC AND ECOLOGICAL ASPECTS OF FIELD RAT CONTROL IN TROPICAL AND SUBTROPICAL COUNTRIES

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ABSTRACT: The vital question, as to the cause of the permanent increase in field rat populations throughout most tropical and subtropical areas, has been the subject of researchers and fieldmen during the past years, in the hope of finding an answer to this problem.

Man has made his way through history wherein he was gradually able to renounce nature and establish his own man-made cultural frame. Unlike other mammals, man has no natural instincts to guide him through life. Brain and spirit have to compensate for lack of physical capabilities and instincts. Man was forced to change his natural surroundings in order to serve his special and ever-growing needs. Survival meant not only using nature but more so changing it in order to develop his culture. The field rat has become man's "cultural treader".

Myomorpha is the largest suborder of the Order Rodentia. Of the 1700 rodents known to man, more than 1100 belong to this group. The greater part of the Myomorpha species are found within two families, which are Cricetidae with about 567 species and Muridae with about 475 species.

Most of these rodents live either in trees or under the ground. They rarely collide with man's interest. Only a few rodent species have become "field rats" and seem to dwell in and utilize man's cultural steppe. Some species have even become cosmopolitan and are found in Europe, Asia, Australia, Africa, South, Middle, and North America, leaving only Madagascar and New Zealand without infestation.

Field rats are considered the most successful mammals including man. This is due to their fine balance of curiosity and caution, to their instructive behavior and to their well-balanced, often highly developed social structure. The field rat finds, in the man-made or man-modified environment, an almost ideal habitat.

Subsistence farming, when looked upon from an ecological viewpoint, has little impact in harming the natural environment. Nature's equilibrium is maintained with this method. Field rats have but a meek chance to dwell within the frame of the traditional farming system.

INTRODUCTION

Man has modified the natural environments. In the process he changed the types of habitats he met with and disrupted, to varying degrees, the cycle of renewal of life. In many parts of the world, man has failed to understand and recognize the biological, natural interdependence. Field-rat problems are foremost social, economic, political and religious problems rather than biological anomalies. It is primarily a problem created by man and not by the rodent.

Since 1973 I was fortunate enough to have had various assignments as a rodent damage control consultant with the German Agency for Technical Cooperation (GTZ) and the Food and Agricultural Organization (FAO) in several countries in Africa, Asia, Europe and America. These assignments have deepened my understanding toward the aspects of interdependence of man and the field rat.

SUBSISTENCE FARMING HAS LITTLE IMPACT IN HARMING THE NATURAL ENVIRONMENT

In view of socio-economics, traditional peasantry in a given area could serve as an example. The traditional farming family tills only a limited area of soil and it usually doesn't exceed the area still manageable by an average rural family. The harvest gained from subsistence farming serves mainly to nourish the own family, while only little surplus can be sold in order to procure other necessary items on the local market.

The traditional farming system, practiced successfully for many centuries, puts to use joint effort of an entire rural family, in sowing and planting crops within a given pattern of a tribe, village or country. Joint family effort is used in preventing serious harm to field crops by fighting, controlling or destroying, in a natural, and rather primitive way, agricultural pests during the whole cropping season. This system of subsistence agricultural production, which is still practiced in many developing countries of the world, has little impact in harming the natural environment. Nature's equilibrium was and still is maintained by this method. Traditional farming thus keeps the ecological balance in our natural environment as has been demonstrated over centuries.

A MEAK CHANCE FOR THE FIELD RAT

As mentioned above, many villages in developing countries still practice the traditional farming system. Since each member of the rural family is regularly concerned with keeping the fields free from weeds, rats have only a meek chance to dig burrows unobserved. Thus, in a sanitary-kept field, the rat population is kept low.

Additional help in keeping the field rat population low is given by encouraging the natural enemies (such as the local predators) in multiplying and thus preying massively on the rat menace. Where pesticides are used only with the utmost of care, this can be achieved.

Subsistence farming allows its environment to keep its balance. It most likely also ensures a good harvest, essentially free from rat damage as well as other agricultural pests in ordinary years.

Disturbances of the ecological balance in rural areas have steadily increased over the last century. Among reasons responsible for this unfortunate situation in many areas of the world are changes in agricultural patterns, the introduction of continuous planting by way of modern techniques, and the increasing use of pesticides which is needed to protect the high-yielding varieties.

DROUGHTS OR FLOODS CHANGE THE ECOLOGICAL BALANCE OF THE NATURAL ENVIRONMENT

A disturbance of the ecological balance of the environment may come in the form of droughts or floods. This natural form of calamity may destroy a harvest and at the same time may constitute an environmental imbalance for years to follow. This natural form of disturbance is somewhat different than the "cultural disturbance" which very often is imposed by man.

A long period of drought or floods will most likely destroy a complete harvest. Agricultural pests and their predators will herewith also be destroyed or driven off. A new life-cycle may be started again on equal basis and with equal chances. In contrast to this perfect system of nature, the man-made interferences usually lack this farsightedness and thoroughness.

Immediately following a natural calamity, the general situation in a field may look desperate to man. Since only the field rat, due to its high multiplication rate, will tend to fill the vacuum that was left by the flood or drought rapidly, farmers seem to be helpless.

The natural enemies of the field rat may need several years to establish their population again. This is the time when the field rat population increases rapidly, especially so if food and water are abundant due to the continuous planting of agricultural products. This rise in the rat population may continue far beyond what may be considered an ordinary high population.

At this stage, it should be remembered that the life span of the field rat is only short and seldom exceeds one year, in contrast to many of its predators. If at this stage, man could overcome his fear and his strive for chemical combat, the natural environment would, within a short period of time be able to find its ecological balance again.

DESTROYING NATURE IN ORDER TO PRODUCE MORE FOOD

With the introduction of modern technologies, the agricultural scene has changed. The development of large agricultural production schemes, the establishment of irrigation systems with their irrigation and drainage canals have contributed their share in disturbing the ecological balance of the environment in agricultural areas. With the introduction of modern agricultural technologies, continuous utilization of land throughout the entire year came into use. Monocultures are the result of mechanization, since they generally call for large areas in order to utilize the machinery. With expanding monocultures, however, the natural diversity of fauna and flora has changed. High-yielding varieties, massive fertilization and the use of pesticides on a wide scale, have become normal practices.

THE FIELD RAT - A "CULTURAL TREADER"

Myomorpha is the largest suborder of the Order Rodentia. Of the 1700 rodents known to man, more than 1100 belong to this group. Most of the Myomorpha species live either in trees or under the ground. They rarely collide with man's interest. Only a few rodent species have become "field rats" and seem to dwell in and utilize man's cultural steppe. To give an example, Rattus argentiventer, Rattus rattus, Rattus exulans, Bandicota indica and Bandicota bengalensis have become important pests in Asia while Mastomys natalensis, Arvicanthis niloticus, Rattus rattus, to name only a few, have become a menace to agricultural crops in Africa.

The field rat, unlike its predators is considered a good example of a "cultural treader". This means it readily adapts itself to the man-modified environment. The field rat lives a less disturbed existence in man-made surroundings than does its predators, which cannot easily adapt and are driven away. A permanent, rather high rat population is the result.

Nowadays, considerable areas of land have been turned into a man-developed "agricultural steppe" -- an area where inadequate consideration has been given to the ecological balance of the environment.

Man has made his way through history by gradually parting with nature. Brain and spirit of man have to compensate his lack of physical capabilities and instincts, forcing him in turn to modify his ecological niche in order to serve his ever-growing needs.

"CULTURAL STEPPE" -- IDEAL ENVIRONMENT FOR FIELD RATS

Human survival means changing and using natural environment in developing culture. There was a time when man managed to satisfy his needs in accordance with nature. Less than two centuries ago, man started a rapid development forcing him to extend his ecological niche. Today, our modern agricultural system puts increasing pressure on the traditional subsistence type of farming. The increasing demand for food and the demand for more agricultural cash crops make subsistence farming unprofitable. The modern agricultural system, however, disregards nature's laws and a total destruction of our natural environment seems to be unavoidable.

Only few animals utilize man's cultural steppe. The field rat is one. It is considered one of the most successful mammals due to its fine balance of curiosity and caution in its instinctive behavior, its extremely good physical abilities and its well-balanced highly-developed social structure. The field rat finds, in our "agricultural steppe" an almost ideal environment. Here it finds food, water and shelter the whole year round in abundance, while its natural enemies may nearly or totally be absent.

FIELD RAT DAMAGE CONTROL WITH THE LEAST HARMFUL EFFECTS TO THE ECOLOGICAL SYSTEM

Aside from the natural calamities and the establishment of an agricultural steppe (such as agricultural schemes or intensive, small-scale farming) leading to a possible higher field rat infestation, other interdependent factors such as the rodent species involved, a given environment, annual rainfall and temperature as well as other factors must be taken into consideration.

To prevent field rat damage to agricultural crops, integrated rodent damage control should be advocated. It would be carried out with the least harm to the natural environment. Using rodenticides only has not proven effective. While temporary use of rodenticides may be successful, the field rat problem is most likely to be manifested again within a few years. This is especially the case where inadequate and improper application of the chemicals have been made. If this happens, damage to crops by rodents may continuously increase.

The Departments of Plant Protection in many tropical and subtropical countries still call for more effective rodenticides. It is necessary to become alert to the changes of environmental conditions resulting from man's activities. The planning, the organization and the implementation of large-scale rodent control activities should be carried out in close cooperation with the government institutions and the farmers' organizations. A successful control program can then be carried out with the least harmful effects to the ecological system of a given natural environment. This form of joint rodent damage control activities puts into consideration the new man-modified environment. Furthermore, government and private cooperation will more readily be able to develop more effective control techniques that should prove harmless to other than the target species.

FIELD RAT CONTROL AS INTEGRATED PART OF CROP PROTECTION

Integrated preventive field rat damage control is advocated in order to meet the ever-changing field situations in man's "agricultural steppe". Depending upon the situation found in an infested area, all appropriate types of damage control measures should be practiced by the farmers. Field rat damage control must become an integrated part of general crop protection in a given area, village or country.

The "Community Type of Field Rat Damage Control Program", developed within rodent damage control projects of the German Agency for Technical Cooperation (GTZ) in Asia, has given hope that a preventive, sustained rodent damage control program will satisfactorily be carried out in wide areas and at a predetermined time by the farmers. This program aims to ensure that field rat damage to agricultural crops in a given area is kept at a tolerable level with little or no harm done to the natural environment.

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